PACKAGING APPARATUS AND METHOD

DESCRIPTION

Technical Field

The present invention relates generally to the field of packaging, and more specifically to an apparatus and method for packaging items for protection during shipment.

Background of the Invention

Consumers demand that products they purchase be free of surface marks or any other physical damage. Often, damage to products occurs during shipping. Regardless of the type of shipment (i.e., water, air, road or rail), products may be subjected to physical impact, dropping, crushing, tearing, breaking, rough handling, puncturing or collision at any time. There are a variety of methods and devices which are commonly used for insulating and protecting products and components from physical damage during handling, shipping, transportation, etc.

Included in those devices which are utilized to isolate and protect products from damage are insulating materials and insulating devices. Examples of insulating devices include special containers, such as boxes, envelopes and other shipping containers. Such devices may be filled with various padding or other filler materials that are useful as impact insulation and shock absorption. For instance, materials such as corrugated cardboard, used alone or in conjunction with plastic "bubble wrap", foam beads, foam "peanuts" or the like, generally represent the state-of-the-art in protecting fragile objects during shipping.

Examples of insulating materials include various packaging components. Such materials are selected and designed for the purpose of providing specific packaging properties or a range or properties. Examples of packaging materials include paper, corrugated paper, fiber board, polyurethane foam and boards, expanded polystyrene, polyethylene foam, polypropylene foam, and the like. Further, engineered packaging components may be utilized.

Examples of engineered packaging components include plastic bags, corrugated cartons, wood or paper pallets, corrugated slip sheets, expanded polystyrene corners, polyurethane foam inserts and other plastics, just to name a few. For purposes of this disclosure, the terms "packaging," "protection," "insulating" and "cushioning" are intended

to refer to all of the processes and factors relevant to ensuring the safety of an item or items during the "material handling" process. Additionally, for purposes of this disclosure, the term "material handling" is intended to refer to all of the processes and factors relevant to the staging, organizing, storing, locating, loading, moving, shipping, unloading, wrapping, tracking, protecting and generally the overall safety and preservation of the products.

Another common method of protecting consumer products is to make a molded expanded polystyrene (EPS) barrier that encloses all or part of the item to be protected. The EPS along with the product are then usually placed in a corrugated box or container which is sealed for shipment. One significant downside to EPS packaging is the extreme cost associated with the molds to create the EPS insulation. In order to precisely shape the molded EPS for the particular product, tooling must be specifically designed. While very expensive, this tooling has a somewhat limited production life. Different tooling and molded packaging part design is needed for each and every different item to be shipped if a close conforming fit between the part and the EPS barrier is desired. Further, the machinery for molding EPS is very expensive and thus is a major factor in the cost of such protective packaging.

Further, requirements for determining the means for packaging a product includes the cost and time to complete the process. Often, products are merely over-wrapped in a polymer-based protective sheet wrapping material. This over-wrapping may be secured around the product with tape or other strapping material. Such a process, however, results in excess waste of the over-wrapping product and strapping material, thereby increasing cost. Furthermore, such a process is slow and often does not accomplish the desired result because of inherent deficiencies.

As illustrated above, a multitude of various packaging materials and devices exist today. Most of these materials and devices, however, are not readily adaptable to varying sizes and shapes of product. Additionally many of these materials and devices have performance and cost deficiencies. Accordingly, a simple and inexpensive apparatus and method for packaging a variety of products is desired.

Summary of the Invention

The present invention provides a protective covering for products. According to one aspect of the present invention, the protective covering is tubing. The tubing has an inner

surface, an outer surface, a first end having a first opening adjacent the first end, a second end having a second opening adjacent the second end, and a length extending approximately from the first end to the second end. The inner surface of the tubing defines a cavity extending inwardly from the first opening. The cavity is accessible from the first end and the second end of the tubing for inserting product into the cavity. Further, means are provided for closing the first and second ends of the tubing to secure product stored within the cavity of the tubing.

According to another aspect of the present invention, the product stored within the cavity of the tubing relates to automotive products. In one preferred embodiment, automobile bumpers are wrapped in the protective tubing covering.

According to another aspect of the present invention, the means for closing the first and second ends of the tubing comprises respectively sealing the first and second ends. Additionally, the means for closing the first and second ends of the tubing may comprise taping the first end of the tubing, and taping the second end of the tubing. In one embodiment, the first end of the tubing is folded against the outer surface of the tubing and taped in place, and the second end of the tubing is folded against the outer surface of the tubing and taped in place.

According to another aspect of the present invention, the protective covering is a substantially continuous tubing. The substantially continuous tubing has a length, and comprises a tubing having an outer surface and an inner surface. The inner surface of the tubing defines a cavity.

According to another aspect of the present invention, the substantially continuous tubing is cut at intervals into discrete sections having a length. The discrete sections of tubing are adapted to accept product or items to be protected within the cavity of the tubing. The length of the discrete sections of the sheared tubing may be variable or substantially uniform.

According to another aspect of the present invention, a cutter having a cutting surface, engages the substantially continuous tubing and is utilized to cut the substantially continuous tubing into the discrete sections. In one embodiment, the cutter engages a rail and traverses about the rail. The cutting surface of the cutter is adapted to shear the tubing during traversing of the cutter about the rail.

According to another aspect of the present invention, the protective covering comprises an overwrap material. The overwrap material has a first edge and a second edge. The first and second edges are joined substantially adjacent the edges to form a substantially continuous tubing having a cavity. The substantially continuous tubing has a first opening which provides access to the cavity of the tubing, and the substantially continuous tubing is adapted to have the items to be wrapped inserted into cavity of the tubing through the first opening.

According to another aspect of the present invention, the first and second edges of the overwrap material are secured to one another longitudinally about the tubing. In one embodiment the first and second edges are secured with a stitching. According to another aspect, the first and second edges are connected in an overlapping configuration. In another embodiment, the first and second edges are connected in a fin seal configuration.

According to another aspect of the present invention, the portion of the substantially continuous tubing opposing the first opening is maintained in a roll prior to having the items inserted into the cavity of the tubing through the first opening. In a preferred embodiment, the roll of the substantially continuous tubing has no core.

According to another aspect of the present invention, the protective covering is made of a laminate material comprising a plurality of layers. In one embodiment, the laminate material comprises two layers, a first layer and a second layer, adhered together. In a preferred embodiment, the layers of the laminate material are adhered together, preferably with the use of heat.

According to another aspect of the present invention, the first layer and the second layer of the laminate composition are made of materials having different properties. In one embodiment, the first layer of the laminate composition is made of a first material having protective properties, while the second layer of the laminate composition is made of a second material having cushioning properties.

According to another aspect of the present invention, the first layer of the laminate composition is a high density material having properties to substantially resist tearing or puncturing of the tubing. And, the second layer of the laminate composition is a low density material having cushioning properties. In a preferred embodiment, the first layer of the laminate composition is made of a high density polyethylene, and the second layer of the

laminate composition is made of a low density polyethylene. In a most preferred embodiment, the low density polyethylene is a low density polyethylene foam material.

According to another aspect of the present invention, a covering for protecting items that are placed within the covering is made of a substantially continuous tubing having an inner surface, an outer surface, and a first opening providing access to a cavity of the continuous tubing. The continuous tubing is adapted to have the items to be protected inserted into cavity of the tubing through the first opening. Further, the inner surface of the tubing has cushioning properties to cushion items that are located in the cavity of the tubing, and the outer surface of the tubing has properties to substantially resist tearing or puncturing of the tubing during normal use. The substantially continuous tubing is adapted to be sheared into intervals of tubing. Typically, the length of the intervals of the tubing is less than the length of the substantially continuous tubing. Additionally, the length of the intervals of the tubing is typically greater than the length of the product placed within the tubing.

According to another aspect of the present invention, a method of manufacturing the protective container is provided. In one method a sheet material having a protective first surface and an opposing cushioning second surface is provided. The sheet material also has a first edge and an opposing second edge. A substantially continuous tubing having a cavity is formed by joining a portion of the sheet material adjacent the first edge to a portion of the sheet material adjacent the second edge. The second surface of the sheet material forms a wall of the cavity.

According to another aspect of the present invention, the sheet material is a substantially continuous sheet material, and the tubing manufactured from the sheet material is a substantially continuous tubing.

According to another aspect of the present invention, the step of joining the first and second edges comprises stitching the first and second edges together about a longitudinal axis of the tubing.

According to another aspect of the present invention, the method of creating the sheet material comprises providing a first material having protective properties, providing a second material having cushioning properties, and laminating the first and second materials together to form a laminate composition.

According to another aspect of the present invention, the step of joining a portion of the sheet material adjacent the first edge to a portion of the sheet material adjacent the second edge creates a seam. The method further comprises the step of cutting the substantially continuous tubing transverse to the seam to create separate pieces of the tubing.

According to another aspect of the present invention, the method of manufacturing a protective container comprises the steps of providing a first layer of material, providing a second layer of material, adhering the first layer of material to the second layer of material to create a laminate material, the laminate material having a first edge, and a second edge, folding the laminate material such that the first edge and the second edge are substantially adjacent one another, and securing a portion of the laminate material adjacent the first edge to a portion of the laminate material adjacent the second edge to create a protective tubing.

According to another aspect of the present invention, a system is provided for protecting a product during any step of material handling. The system comprises a supply of substantially continuous tubing, the tubing having a leading edge, an unwind supporting the supply of substantially continuous tubing, and a cutter having a cutter surface. The cutter selectively engages the substantially continuous tubing at a position distal the leading edge to shear the tubing into intervals of tubing having a length. The intervals of tubing are adapted to accept items within the cavity.

According to another aspect of the present invention, the unwind of the system has rollers for allowing a portion of the supply of substantially continuous tubing distal the leading edge of the supply of substantially continuous tubing to be positioned at the cutter. In one embodiment, the unwind has first rollers offset from second rollers to allow for varying diameter rolls of tubing.

According to another aspect of the present invention, the system has a cutting rail. The cutter engaging the cutting rail and traverses about the rail. During traversing of the cutter about the rail, the cutting surface of the cutter is adapted to shear the tubing.

According to another aspect of the present invention, the system has a surface for supporting the substantially continuous tubing during shearing thereof. In a preferred embodiment, the surface is located adjacent the cutter.

According to another aspect of the present invention, a system for protecting a product during any step of material handling is provided. The system comprises a supply of sheet material, having a first surface, a second surface opposing the first surface, a first edge,

and a second edge opposing the first edge, a converter, a joiner downstream of the converter, and a cutter downstream of the joiner. The converter has a former for folding a portion of the supply of sheet material between the first edge and the second edge. After a portion of the sheet material is folded, a first portion of the second surface of the sheet material is adjacent a second portion of the second surface of the sheet material. The joiner joins the sheet material substantially adjacent the first and second edges of the sheet material to form the tubing. The cutter has a cutter surface that selectively engages the tubing to shear the tubing into intervals of tubing having a length. The intervals of tubing are adapted to accept items within the cavity.

According to another aspect of the present invention, a method of overwrapping products to protect the products is provided. The method comprises providing a length of tubing, the tubing having an inner surface and an outer surface, the inner surface defining a cavity, the tubing further having a first end and a second end, inserting the product into the cavity of the tubing, and sealing the first and second ends of the tubing, respectively, to secure the product within the cavity of the tubing.

According to another aspect of the present invention, the tubing utilized to overwrap products has a length, and the product to be inserted into the tubing has a length. The length of the tubing is greater than the length of the product.

According to yet another aspect of the present invention, the process utilized to seal the first end of the tubing is to fold the tubing adjacent the first end and then to tape the first end to the outer surface of the tubing adjacent the first end. Similarly, the process utilized to seal the second end of the tubing is to fold the tubing adjacent the second end and then to tape the second end to the outer surface of the tubing adjacent the second end.

Other features and advantages of the invention will be apparent from the following specification taken in conjunction with the following drawings.

Brief Description of the Drawings

To understand the present invention, it will now be described by way of example, with reference to the accompanying drawings in which:

FIG. 1 is a perspective view of a roll of protective tubing of the present invention;

FIG. 2 is an expanded side view of one embodiment of the material comprising the protective tubing of FIG. 1;

FIGS. 3A and 3B are elevation views of various seams of the protective tubing of FIG. 1;

FIGS. 3C and 3D are elevation views of various stitches of the seam of the protective tubing of FIG. 1;

FIG. 4 is a schematic view of the method of the present invention;

FIG. 5 is a perspective view of an unwind assembly of the assembly station of FIG. 4;

FIG. 5a is a schematic top view of the unwind assembly of FIG. 5;

FIG. 5b is a schematic top view of the unwind assembly of FIG. 5;

FIG. 6 is a perspective view of a cutter assembly of the assembly station of FIG. 4;

FIG. 7 is an end view of the cutter assembly of FIG. 6;

FIG. 8 is a perspective view of a product being inserted into the protective tubing of the present invention;

FIG. 9 is a perspective view of a product in an unsealed protective tubing of the present invention; and,

FIG. 10 is a perspective view of a product overwrapped with the protective tubing of the present invention.

Detailed Description of the Preferred Embodiment

While this invention is susceptible of embodiments in many different forms, there is shown in the drawings and will herein be described in detail preferred embodiments of the invention with the understanding that the present disclosure is to be considered as an exemplification of the principles of the invention and is not intended to limit the broad aspect of the invention to the embodiments illustrated.

Referring now in detail to the FIGS., and initially to FIG. 1, there is shown a covering 10 utilized as a protective overwrapping 10 for products during various steps in the material handling process of the products. As explained above, for purposes of this disclosure, the term "material handling" is intended to refer to any or all of the processes and factors relevant to the staging, organizing, storing, locating, loading, moving, shipping, unloading, wrapping, tracking, protecting and generally the overall safety and preservation of the products. In a preferred embodiment, the protective covering 10 is a tubing 11. Products are overwrapped by being inserted into the protective tubing 11 at the assembly

station 12 as shown in FIGS. 4, 8 and 9, and as described in detail herein. In one preferred embodiment, automobile components are wrapped in the protective covering 10. Specifically, automobile bumpers are wrapped in the protective tubing 11 of the present invention. As is understood by one of ordinary skill in the art, however, other products may be wrapped utilizing the protective covering 10 and system disclosed herein without departing from the spirit and scope of the present invention.

The protective covering 10 will be described first in this disclosure, followed by a description of a system and method for overwrapping products utilizing the aspects of the present invention.

Protective Overwrapping Material

In part, the protective overwrapping 10 comprises a material 14 that is utilized to attempt to protect the product contained in the protective overwrapping from any physical damage that may occur during material handling of the product. In a preferred embodiment of the material 14 which makes up the tubing 11 shown in FIGS. 1 and 2, the material 14 comprises a laminate composition of a first layer 16 of material adhered to a second layer 18 of material. When the tubing 11 is assembled from the sheet of material 14 (as shown in FIG. 1), the first layer 16 serves as the outside surface 20 of the tubing 11, and the second layer 18 serves as the inside surface 22 of the tubing 11.

In a preferred embodiment, the first layer 16 is made of a material that has protective properties. In one embodiment, the first layer 16 of material is a polyethylene. The polyethylene, for example, can be high density polyethylene or low density polyethylene, but the preferred polyethylene for the first layer 16 is a high density polyethylene. Utilizing a high density polyethylene material as the outer surface 20 of the protective covering 10 assists in providing puncture resistance and surface protection for the product contained in the tubing 11. In a most preferred embodiment, the first layer 16 of material is a woven high density polyethylene. Additional materials include co-extruded films comprised of varying combinations of linear low density polyethylene, high density polyethylene, low density polyethylene, monolayer high density polyethylene and monolayer low density polyethylene.

Additionally, in a preferred embodiment, the second layer 18 is made of a material that has cushioning properties. In one embodiment, the second layer 18 of material is also a

polyethylene. Again, the polyethylene, for example, can be high density polyethylene or low density polyethylene, however the preferred polyethylene for the second layer 18 is a low density polyethylene. Most preferably, the low density polyethylene for the second layer 18 is made of a low density polyethylene foam to provide cushioning and surface protection for the product contained in the tubing 11. It is understood by those of ordinary skill in the art the other polymeric material or polymeric resin may be utilized for the material 14 of the tubing 11, however polyethylenic resins are preferred.

The polyethylenic resins used in the present invention can be those obtained by polymerizing ethylene, or polymerizing ethylene with other aliphatic monoolefins, such as, propylene, 1-butene, 1-pentene, 3- methyl- 1-butene, 4-methyl-1-pentene, 4-methyl-1-hexene, or 5-methyl-1- hexene alone or mixtures thereof, or with various other polymerizable compounds.

Additionally, polyethylenic resins useful in the invention include homopolymers of ethylene and copolymers of ethylene and other ethylenically-unsaturated monomers having from 3 to about 8 carbon atoms, such as, propylene, butenes, pentenes, hexenes and the like. These comononers preferably have from 3 to about 6 carbon atoms, and, most preferably, have 3 or 4 carbon atoms. The copolymers can include other monomers compatible with ethylene.

The term "polyethylenic resin (or material)", as used herein, is meant to include not only homopolymers of ethylene, but also ethylene copolymers composed both of at least 50 mole percent (preferably at least 70 mole percent) of an ethylene unit and a minor proportion of a monomer copolymerizable with ethylene, and blends of at least 50 percent by weight (preferably at least 60 percent by weight) of the ethylene homopolymer or copolymer with another compatible polymer.

Examples of monomers which are copolymerizable with ethylene are vinyl acetate, vinyl chloride, propylene, butene, hexene, acrylic acid and its esters, and methacrylic acid and its esters. The ethylene homopolymer or copolymer can be blended with any polymer compatible with it. Examples of such compatible polymers include polypropylene, polybutadiene, polyisoprene, polychloroprene, chlorinated polyethylene, polyvinyl chloride, styrene/butadiene copolymer, vinyl acetate/ethylene copolymer, acrylonitrile/butadiene copolymer and vinyl chloride/vinyl acetate copolymer.

The polyethylene foam material can be formed by means of a conventional polyethylene foam sheet extrusion process or any other suitable foam sheet-forming process.

In a typical polyethylene foam sheet extrusion process, pellets of the thermoplastic polyethylene resin are blended with a solid phase nucleating agent and, then, are melted in a heated extruder where the plastic and nucleating agent combination is held at both a high temperature and a high pressure. The blowing agent(s), which generally liquefies within the extruder, and which will vaporize at die melt temperatures and atmospheric pressure, is added to the pressurized melted material. Within the molten extrudate, the blowing agent(s) tends to act as a plasticizer to reduce the viscosity of the extrudate, and, thus, it lowers the level of temperature necessary to maintain the hot melt condition of the mixture of thermoplastic polyethylene material and nucleating agent. The blowing agent(s) is mixed with the melted polyethylenic plastic and nucleating agent, and the combination is, subsequently, cooled to an extrusion temperature suitable for foaming. To prevent the collapse of the resulting foam structure over time, a permeation modifier agent is often also added to the melt composition in the extruder (or as otherwise conventional or suitable). The cooled combination is pushed through a die by the pressure gradient, and, when released to atmospheric pressure, the liquefied physical blowing agent(s) vaporizes and expands to form bubbles of gas at the nucleating sites established by the uniformly dispersed nucleating agent particles. The process can be usually operated on a continuous basis using a conventional extruder system.

The first and second layers 16, 18 of material are adhered together by any suitable means. Preferably the low density polyethylene and the high density polyethylene sheets are extruded in sheet form and laminated together thereafter extruding. Such lamination of the layers may take place immediately thereafter, or after any amount of time. The two layers 16, 18 of material can be laminated together by the use of heat, adhesive and/or any other acceptable means. In a preferred embodiment, the first and second layers 16, 18 of polyethylene are laminated together utilizing heat and pressure. Typically, the temperatures utilized to perform the lamination process range from 180-300° F., and the pressure utilized to perform the lamination process ranges from 30 to 80 p.s.i. The lamination process creates a laminated sheet material 14.

Tubing

The protective overwrapping 10 and protective tubing 11 of the present invention may comprise a single material, a composite material, a blend, a laminate material, or any

other combination of materials. In the preferred embodiment of the present invention the protective tubing 11 comprises the laminate material 14 (a first layer 16 of material laminated to a second layer 18 of material) shown in FIG. 2. To create a protective tubing 11, the material 14 is converted from a sheet material into a tubing.

Initially, the material 14 in sheet form has a first edge 24 and an opposing second edge 26. In a preferred embodiment, the material 14 is provided as a substantially continuous sheet of material 14. As the sheet material traverses through a converter 26, illustrated schematically in FIG. 4, the sheet material is manipulated in a manner commonly known in the art such that a portion of the material 14 adjacent the first edge 24 is positioned to be substantially adjacent a portion of the material 14 adjacent the second edge 26. Once a portion of the first and second edges 24, 26 are substantially adjacent one another, these areas are secured to one another as shown in FIGS. 3A through 3D to create the protective tubing 11. Typically, the sheet of material 14 is joined longitudinally to form the substantially continuous tubing 11. It is understood that the reference to securing or connecting the edges 24, 26 refers to securing any portion of the material 14, from the edges 24, 26 through to, and including the mid-line area of the material 14, to create the tubing 11 of the present invention.

In one method of manufacturing the tubing 11 of the present invention, the tubing is manufactured as a substantially continuous tubing 11. As such, the material 14 utilized for conversion into the substantially continuous tubing 11 is typically a substantially continuous sheet material 14. For purposes of this disclosure, "substantially continuous" means that the substantially continuous material, or substantially continuous tubing, respectively, has a length such that it may be separated into at least two sections for use as a protective covering. In a preferred embodiment, the substantially continuous tubing 11 has a length such that the substantially continuous tubing 11 may be separated into a plurality of sections for use as a plurality of individual protective coverings.

In a preferred embodiment, the material 14 is joined at a seam 29 to form the tubing 11 with an in-line process. Such process may include joining a portion of the material 14 adjacent the first edge 24 of the material 14 to a portion of the material 14 adjacent the second edge 26 of the material 14 by adhering or securing the portion adjacent the first edge 24 to the portion adjacent the second edge 26 to form a seam 29. As is understood by one of ordinary skill in the art, adhering a portion adjacent the first edge 24 of material 14 to a

portion adjacent the second edge 26 of the material 14 to form the seam 29 may be accomplished via any suitable electrical, mechanical or chemical means, including, but not limited to heat, pressure, adhesive, staples, stitching, zippers, buttons, etc. In a most preferred embodiment, stitches 28 extending longitudinally about an axis of the joined sheet of material 14 are utilized to form the seam 29 of the tubing 11. In one embodiment, as shown in FIG. 3D, a surge stitch 31 is utilized to form the longitudinal seam 29. In another embodiment, as shown in FIG. 3C, a double stitch 35 is utilized to form the longitudinal seam 29. It has been found that both the surge stitching 31 and a double stitch 35 is acceptable because they are easy and inexpensive to manufacture, and they provide acceptable strength for the seam 29.

Additionally, the configuration of the seam 29 of the sheet material in forming the tubing 11 may be variable. As shown in FIG. 3A, the first and second edges 24, 26 may be connected in a fin seal configuration. And, as shown in FIG. 3B, the first and second edges 24, 26 may be connected in an overlapping configuration. Excess material extending past the connected area may be trimmed from the tubing 11.

After the sheet material 14 is converted into the tubing 11, the tubing 11 is typically wound into rolls 30 as shown in FIG. 1. The rolls 30 may be wound around a core (not shown) or they may be coreless. A coreless roll provides certain advantages over a roll having a core in that the user does not have to have special machinery to hold the core, there is less waste because there is no core, the weight of the roll is less, and the roll may be substantially flattened for shipping and storage.

As shown in FIGS. 3A-3B and 8-9, the substantially continuous tubing 11 has an outer surface 20, an inner surface 22, and a first opening 32 adjacent the first end 33 of the tubing 11 providing access to a cavity 34 of the continuous tubing 11. The material of the inner surface 22 of the tubing 11 has cushioning properties to cushion product within the tubing 11, and to assist in keeping the surface of the product within the tubing 11 damage free, while the material of the outer surface 20 of the tubing 11 has protective properties to substantially resist puncturing and tearing of the tubing 11 during normal use thereof. As shown in FIG. 8, the substantially continuous tubing 11 is adapted to have items to be protected inserted into the cavity 34 of the tubing 11 through the first opening 32.

System for Overwrapping Products

As shown in FIG. 4, a system 15 for creating a protective tubing 11 for products generally comprises an unwind assembly 36, a cutting assembly 38 and an assembly area 40. Additionally, the system 15 may include some or all of the processes for creating the substantially continuous tubing 11, such as an extruder 42 for manufacturing the sheet material 14, a laminator 44 for laminating multiple layers of material 16, 18 into a composite material 14, a converter 46 for converting the sheet material 14 into a tubing 11 having a seam 29, and an winder 48 for winding the tubing 11 into a roll 30. The converter 46 typically includes a forming plow to convert the sheet material 14 into the tubing 11, and a means for creating the seam 29, such as a sewing apparatus.

Once the tubing 11 has been created, it is typically rolled into a substantially continuous roll 30 as shown in FIG. 1. It is understood that the substantially continuous roll 30 may be relocated to another location for use in the system and method of overwrapping products as described herein. In one embodiment, the roll 30 is transferred to the unwind assembly 36. A preferred embodiment of an unwind assembly 36 for a coreless roll 30 is shown in FIG. 5. The unwind assembly 36 has a frame 50 and a plurality of rollers 54, 58. As best shown in FIGS. 5a and 5b, the unwind assembly 36 also has two first shafts 56, each which hold a plurality of rollers 54 thereon, and a second shaft 60 which also holds a plurality of rollers 58. The first shafts 56 are offset from the second shaft 60 to support or retain the roll 30 and allow the substantially continuous roll 30 of tubing to be unrolled even as the diameter of the roll 30 decreases through use. Typically, the unwind assembly 36 is located upstream of the cutting assembly 38. In another embodiment, the tubing 11 may be transferred directly from the convertor 46 to the cutter assembly 38 and assembly area 40.

The cutting assembly 38, shown in FIGS. 6 and 7, comprises a cutter 62 having a cutting surface 64. In a preferred embodiment, the cutting surface 64 comprises a blade which can shear or cut through the tubing 11. The cutter 62 may also have a guard 66 to shield access to the cutting surface 64 when the cutter 62 is not in use, a handle 68 to allow the user to manipulate the cutter 62, and a positioning member 70 to assist in positioning the tubing 11 such that it can be engaged by the cutting surface 64. In a preferred embodiment, the cutting surface 64 is positioned at an angle to the direction of movement of the cutter 62, and at an angle to the positioning member 70 of the cutter. While this specific cutting assembly 38 is disclosed, any cutter, including but not limited to scissors, knives, blades, etc.

may be utilized to shear the tubing into discrete sections. In the preferred embodiment disclosed, the cutter 62 generally cuts the tubing 11 transversely to the longitudinal axis of the tubing 11.

In a preferred embodiment, as shown in FIGS. 6 and 7, the cutting assembly 38 also includes a cutting rail 72. While not necessary, the cutting rail 72 assists in support the cutting assembly 38, and it also assists in creating accurate cuts with the cutter. The cutter 62 engages the cutting rail 72 and traverses about the cutting rail 72. The cutting rail 72 operates as a track to maintain the cutter 62 in a cutting position during engagement of the tubing 11 by the cutter 62 when the cutter traverses about the cutting rail 72. The cutting rail 72 further has a first area 74 and a second area 76. The first area 74 operates as a staging area to maintain the cutter 62 away from the tubing 11 as the roll 30 of tubing 11 is unrolled, or during any period of non-use. The second area 76 comprises the cutting area. During use, the cutter 62 traverses about the rail 72 from the first area 74 through the second area 76. When in the second area 76 the cutting surface 64 of the cutter 62 typically engages the tubing 11 for shearing the tubing 11 into discrete sections.

In a preferred embodiment, an engagement mechanism 78 is connected to the cutter 62. As shown in FIG. 7, the engagement mechanism 78 has a first mating member 80, and the cutting rail 72 has a second mating member 82. The first mating member 80 of the engagement mechanism 78 slidingly mates with the second mating member 82 of the cutting rail 72 to allow the cutter 62 to slide and traverse about the cutting rail 72. Specifically, the second mating member 82 of the cutting rail 72 comprises opposing flanges 84 of the rail 72, and the first mating member 80 of the engagement mechanism 78 comprises opposing shoulders 86 of the engagement mechanism 78. The flanges 84 of the rail 72 operate to prevent upward movement of the shoulders 86 of the engagement mechanism 78, but allow shoulders 86 to slide about the inner track 88 of the rail 72.

The cutting rail 72 may have its own framework 90 to independently support the cutting rail 72, or the cutting rail 72 may be attached to an assembly table 92 as shown in FIGS. 6 and 7. Additionally, the cutting rail 72 has a removable stop 93 at the end of the first area 74. The stop 93 retains the cutter 62 within the track 88 of the rail 72. The stop 93 may be removed from the rail 72 to remove the cutter 62 from the rail 72.

In a preferred embodiment, a table or assembly surface 92, as shown in FIGS. 6-9, may be provided in the assembly area 40. The assembly table 92 assists in supporting one or

more of the following: a portion of the extended tubing 11, the cutting rail 72, and the product to be inserted into the tubing 11. As shown in FIG. 9, the first area 74 of the cutting rail 72 extends distal the assembly surface 92.

Method of Overwrapping Products

After the tubing 11 has been manufactured, the method of overwrapping products may be accomplished in a variety of manners. One method comprises placing the substantially continuous roll 30 of tubing 11 on the unwind assembly 36. As one of ordinary skill in the art would readily understand, varying steps in the system 15 may occur in varying locations. In a process where the assembly is conducted with a downstream flow from the right to the left, it is preferred that the roll 30 be placed on the unwind assembly 36 such that the leading edge or first end 33 adjacent the first opening 32 of the tubing 11 is removed tangentially from the top of the roll 30 in a clockwise manner. The leading edge 33 of the roll 30 of tubing 11 is pulled past the cutting assembly 38 and onto the cutting table 92, such that a length of the tubing 11 is removed from the roll 30. However, the remaining portion of the substantially continuous tubing 11 opposing the first opening 32, and not being used for the current product covering, is maintained with the roll 30. The product is then inserted into the cavity 34 of the tubing 11 through the first opening 32 as shown in FIG. 8. Typically, a length of tubing proximal the first opening 32 of the tubing is provided between the end of the product in the cavity 34 and the first opening 32. This length of tubing 11 is provided to allow for sealing of the first opening 32. Once the product is inserted in the cavity 34, the tubing 11 can be sheared into a discrete section or integral 94 of the substantially continuous tubing 11 as shown in FIG. 9. The tubing 11 is sheared by cutting the substantially continuous tubing 11 transverse to the seam 29 to create the separate section 94 of tubing. The separate section 94 of the tubing has a length which is less than the length of the substantially continuous tubing 11. When the tubing 11 is sheared into the separate tubing section 94, a second end 96 having a second opening 98 is developed. Typically, a similar length of tubing proximal the second end 98 of the tubing is provided between the opposing end of the product in the cavity 34 and the second end 98 of the tubing. This length of tubing 11 is provided to allow for sealing of the second opening 98. The tubing may be cut into sections having variable or substantially uniform length.

Another method of overwrapping products, as shown in FIG. 9, comprises initially cutting the substantially continuous tubing 11 into a plurality of discrete sections 94 before product is positioned within the cavities 34 of the tubing sections 94. As such, each discrete section 94 of tubing will have a first end 33 having a first opening 32, a second end 96 having a second opening 98, and a length extending approximately from the first end 33 to the second end. The cavity 34 of the tubing sections 94 is accessible from both the first end 33 and the second end 96 of the sections 94. Typically, the length of the tubing sections 94 is greater than the length of the product.

After the substantially continuous tubing 11 has been sheared into a discrete section 94 of tubing, and once the product is appropriately fitted within the cavity 34 of the tubing 94, the ends 33, 96 of the tubing 94 can be sealed or closed to secure the product with the protective overwrapping as shown in FIG. 10. One means for closing the first and second ends 33, 96 of the tubing comprises respectively sealing the first and second ends 33, 96. Another means for closing the first and second ends 33, 96 of the tubing comprises taping the first end 33 of the tubing, and taping the second end 96 of the tubing to close the openings 32, 98. This may be accomplished by folding a portion of the tubing 94 adjacent the first end 33 against the outer surface 20 of the tubing and taping the first end 33 to the outer surface 20 of the tubing. Similarly, a portion of the tubing 94 adjacent the second end 96 of the tubing may be folded against the outer surface 20 of the tubing and taped to the outer surface 20 of the tubing.

Accordingly, the protective tubing 11 and system 15 of the present invention provide a simple and inexpensive system for over-wrapping product to protects the products during the various stages of material handling. Specifically, the present invention provides a product and system which minimizes waste, minimizes assembly time, has a low capital cost, and provides superior performance. As such, the present invention overcomes the deficiencies in overwrapping seen in the prior art.

While the specific embodiments have been illustrated and described, numerous modifications come to mind without significantly departing from the spirit of the invention, and the scope of protection is only limited by the scope of the accompanying Claims.